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# SQ3R method assisted by ethnomathematics-oriented student worksheet: The impact of mathematical concepts understanding

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**Abstract.** This study was aimed to determine the impact of the SQ3R method assisted by ethnomathematics-oriented student worksheets on students' ability to understand mathematical concepts which compared with the SQ3R method without ethnomathematics-oriented student worksheets. The research method used was quasi-experimental research. The SQ3R method assisted by an ethnomathematics-oriented student worksheet was implemented in the experimental class while the control class was treated by the SQ3R learning method. The design of this study was the pretest-posttest control group design to see the effectiveness of the SQ3R method assisted by ethnomathematics-oriented student worksheets. A cluster random sampling technique was used to determine the sample of the study. The data collection technique employed in this study was an essay test to measure the students' ability to understand mathematical concepts. The results showed that the SQ3R method assisted by ethnomathematics-oriented student worksheet was more effective toward students' mathematical concepts understanding compared to the SQ3R learning method. The application of learning provided better results in increasing students' ability to understand mathematical concepts.

**Keywords:** ethnomathematics, mathematical concept understanding, sq3r, student worksheet

## 1. Introduction

The millennial era requires learning novelty in education [1,2]. Mathematical concepts are related to one another [3-5]. This relationship is evidence of the importance of understanding mathematical concepts [6]. Concept understanding is the ability to understand and distinguish various forms of mathematics problems[7-10]. The learning process needs to attract attention and motivation to learn mathematics which in turn will improve the understanding of the concept, learning outcomes, and the achievement of mathematics learning[11,12]. The concept of understanding mastery is important to achieve basic skills such as reasoning [13-15], communication, connection, and problem-solving [16]. The concepts of understanding ability can be a basis for thinking and solving problems [12].

One solution to overcome this problem is the application of the SQ3R method [17-19]. The SQ3R method consists of five steps, namely Survey, Question, Read, Recite, And Reviews. It can actively engage the students to think and understand mathematical concepts [20-22] so that they can concentrate and focus on the essence of learning materials [23-25]. Students' mistakes in learning are important to



be noticed by teachers so that the types and forms mistakes can be recognized and can be made as a source of learning information and understanding for students [26-28]. Building ideas and making conclusions need to be done by students when the strategy has been selected [29-31].

Also, the teacher's creativity is important to prepare learning that attracts the students' attention [32]. It is necessary to have teaching materials in the student worksheet so that the students are interested in the material presented [33-35]. Educational institutions are also important components in fostering a caring attitude for the country, customs, and culture [36,37]. Therefore, teachers need to link mathematics learning with culture and have the skills to design and develop mathematics teaching materials that are responsive to local values/ethnomathematics [38].

Based on previous research on ethnomathematics by Rosida Rakhmawati M, that traditional society of Lampung have applied mathematical concepts contained is custom home building, the local unit of Lampung, geometric shapes motif of tapis, as well as traditional games Lampung as main topic to increase mathematical concepts understanding [39,40], mathematical concepts understanding through the SQ3R method by Almira Amir obtained that it used to read material and math problem practically, making it easier for students to understand mathematical concept in their way of thinking [41] and ethnomathematics approach has been proven to be interesting, influences students' critical thinking skills, and fosters a love for local culture, especially Lampung culture. This study is different from previous research, the novelty of this research is combines the SQ3R method assisted by ethnomathematics-oriented student worksheet and Lampung culture to determine whether or not the SQ3R method assisted by ethnomathematics-oriented student worksheet influences the students' mathematical concept understanding ability. This Research contributes in the field of education as well as preserving culture in understanding mathematical concept easily and practically. This study aims to see the mathematical concepts understanding by applying the SQ3R method assisted by ethnomathematics-oriented student worksheets.

## 2. Research Method

The method used was quasi-experimental. This study consisted of an experimental class that was treated with the SQ3R method assisted by an ethnomathematics-oriented student worksheet and a control class that was treated with the SQ3R learning method without student worksheet. The design of this research was a pretest-posttest control group design to see the impact of the SQ3R method assisted by ethnomathematics-oriented student worksheets. The design pattern of this research is presented in figure 1.



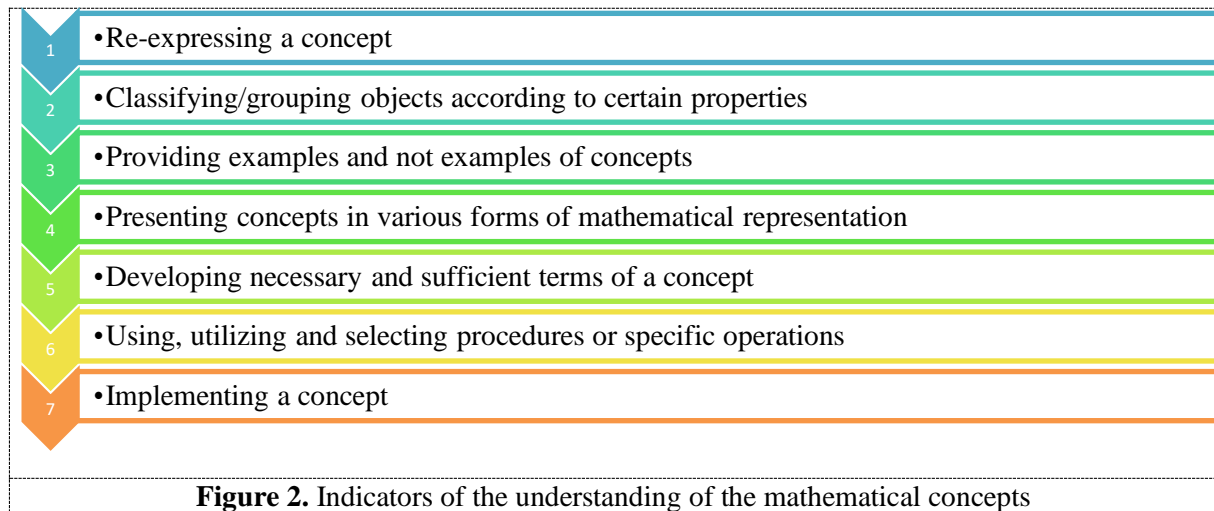
Description: X : SQ3R method assisted by an ethnomathematics-oriented student worksheet  
Y : the understanding of the mathematical concepts

The population of this study consisted of 292 students of the ninth-grade of MTs Negeri 1 Pringsewu, Indonesia in the 2020/2021 academic year. The sampling technique used was a cluster random sampling technique. The samples of this study consisted of 60 students. The data collection technique used was a test to measure the mathematics concepts understanding ability. The research employed was an essay test. The prerequisite tests performed in this study were the normality test and the homogeneity test. The data was analyzed by employing the independent t-test assisted by SPSS 21. Hypotesis in this research are following:

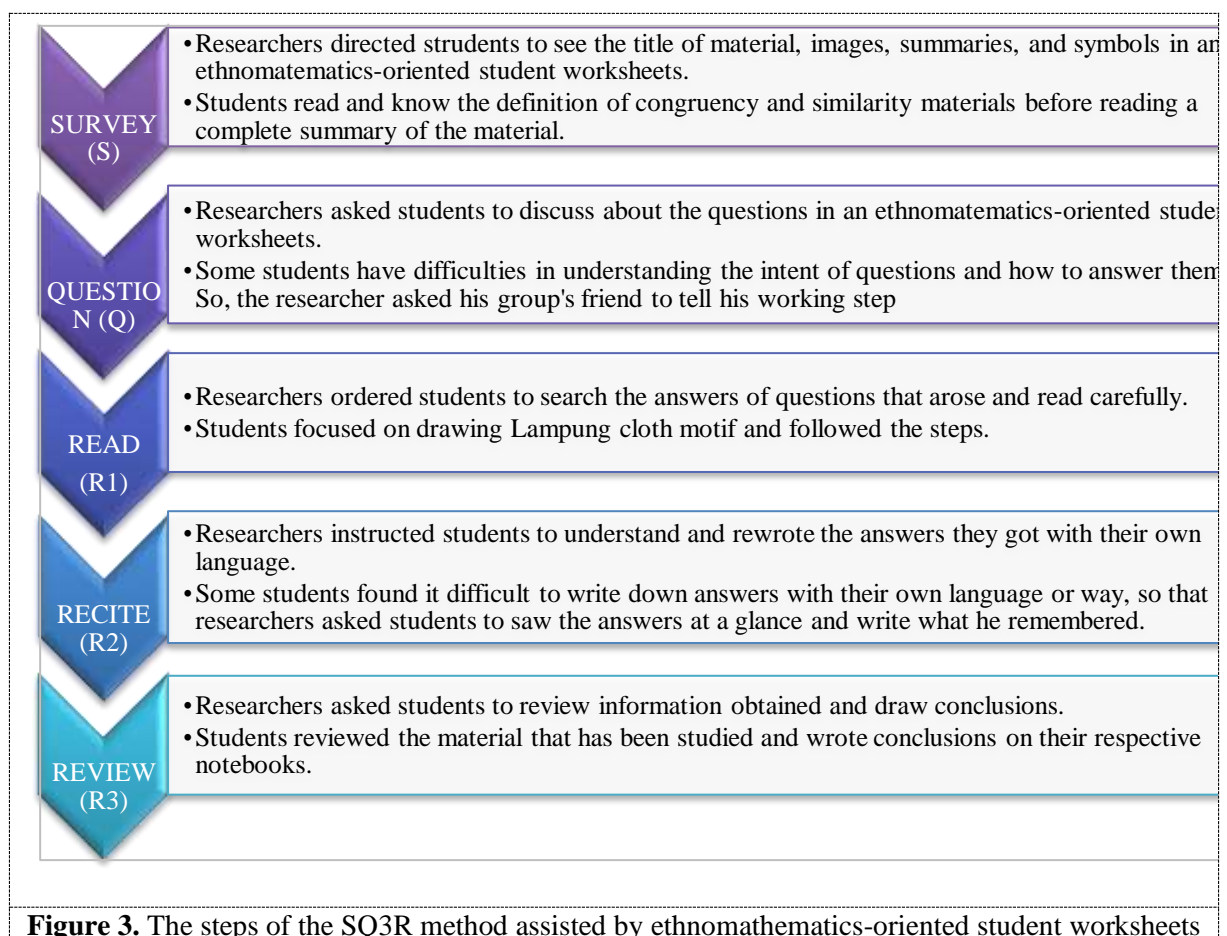
$H_0$ : The SQ3R method assisted by ethnomathematics-oriented student worksheet was not more effective than the SQ3R learning method without ethnomathematics-oriented student worksheet on students' mathematical concepts understanding.

$H_1$  : the SQ3R method assisted by ethnomathematics-oriented student worksheet was more effective than the SQ3R learning method without ethnomathematics-oriented student worksheet on students' mathematical concepts understanding.

The indicators of the understanding of the mathematical concepts are described in figure 2:



The steps of the SQ3R method assisted by ethnomathematics-oriented student worksheets were:



Each SQ3R learning stage was completed in 3 meetings. Learning activities in the form of student surveys on the material were done through reading and writing the title of the material and writing down things that have not been understood in a notebook. They also wrote down some of the questions in the student worksheet and answered them through group discussions and presentations in front of the class. Then, they wrote down the conclusions of the discussed material.

When the students were facing difficulty during the learning, the researchers re-explained the unclear points by writing them on the blackboard so that they can understand and able to provide answers.

### 3. Results and Discussion

The samples were divided into two groups, namely the experimental class consisted 30 students that was given the treatment in the form of the SQ3R method assisted by an ethnomathematics-oriented student worksheet and the control class consisted 30 students that was given the treatments in the form of SQ3R learning method as conventional method. After the treatments had been conducted, the researchers obtained the data to be analyzed, namely the test data of students' mathematical concept understanding.

The research instrument employed in this study was an essay test. Before the treatments were conducted, a pretest was conducted to obtain the students' initial data on mathematical concepts understanding. The description of the pretest data on the students' mathematical concept understanding of congruency and similarity materials is displayed in table 1.

**Table 1.** The Description of Pretest Score in the Experiment Class and Control Class

	Descriptive Statistics				
	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
Pretest Experiment	30	4	50	<b>24.80</b>	<b>10,768</b>
Pretest Control	30	14	39	<b>26.03</b>	<b>7,568</b>
Valid N (listwise)	30				

Table 1 shows that the maximum score of the mathematical concept understanding test of using SQ3R method assisted by ethnomathematics-oriented student worksheets is higher than the conventional one. In contrast, the average score of SQ3R method without student worksheet learning is higher than learning in the experiment class.

Students' mathematical concepts understanding was low because previously never learned about material in daily life especially in Lampung cultures, different from previous reserach that traditional society of Lampung have applied mathematical concepts. Students' steps oriented toward final answer and not use processes. So, it was necessary to apply a Posttest to see the increase in students' mathematical concepts understanding.

The posttest was conducted to determine the final state between the experimental class and the control class after the treatments had been conducted. The data description of the results of the posttest can be seen in Table 2.

**Table 2.** The Description of Posttest Score in the Experimental Class and Control Class

	Descriptive Statistics				
	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
Posttest Experimental	30	64	93	80.30	6,959
Posttest Control	30	50	79	65.40	7,677
Valid N (listwise)	30				

Based on Table 2, indicated of the treatment of the experimental class was used SQ3R method assisted by an ethnomathematics-oriented student worksheet. Learning activities was used SQ3R method

assisted by an ethnomathematics-oriented student worksheet was better than SQ3R method without an ethnomathematics-oriented student worksheet because an ethnomathematics-oriented student worksheet refers to a scientific approach so that students' can observe, questions, gather information, associate, and communicate the material which related with lampung culture. The lowest posttest score in the control class was 50, the highest score was 79 and the mean score of the control class was 65.40. Based on the data, it can be concluded that the students' posttest score had reached the minimum standard. Table 3 & 4 are the prerequisite test for normality and homogeneity as follows:

**Table 3.** The Results of Normality test

Class	Kolmogorov-Smirnov		
	Statistic	Df	Sig.
Posttest Experimental	0.159	30	0.051
Posttest Control	0.134	30	0.180

**Table 4.** The Results of Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Mathematical Concepts Understanding Results	Based on Mean	0.552	1	58	0.461
	Based on Median	0.634	1	58	0.429
	Based on Median and with adjusted df	0.634	1	57	0.429
	Based on the mean trimmed	0.560	1	58	0.457

Table 3 shows that the data was normally distributed with a significant value lower than 0.05 while Table 4 shows that the sample was homogeneous with a significant value of  $0.461 > 0.05$  in the experimental class and control class.

The independent sample t-test was performed because there was one independent variable and one dependent variable. The analysis was performed with the help of SPSS Version 21. The results can be seen in table 5.

**Table 5.** Independent Sample t-test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	F	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
NGain Score	Equal variances assumed	1.138	0.290	7.365	58	0.000	20.61430	2.79902	15.01145	26.21714

Based on Table 4, the t-test results showed that the significant value (2-tailed) was 0.000 which means  $\text{sig} < 0.05$ . Thus, it can be concluded that  $H_1$  was accepted which indicated that the SQ3R method assisted by ethnomathematics-oriented student worksheet was more impact than the SQ3R learning method without ethnomathematics-oriented student worksheet on students' mathematical concepts understanding.

The result of Celikler D. And Aksan Z. research [42] shows that student worksheet is more successful than conventional methods. Based on Rosida Rakhmawati M. research, Lampung people, without special training, have applied mathematical concepts in building and designing traditional houses,

designing the patterns and borders of *tapis*, and constructing children's traditional games. The research result of Z. Wijayanto [40] on ethnomathematics-oriented student worksheet has met the validity aspects, practicality, and effectiveness. Ethnomathematics reflects cultures and can be applied to the education system [43]. Learning using a culture-based student worksheet is a new thing for students that will make them enthusiastic in learning [44] so that it can improve their mathematical skills [45]. Mobile learning based on ethnomathematics has also proven effective for students [46], the mathematical context that has been identified on the Yogyakarta culture that consist of various form as game icons, images with ethnomathematics as learning material and quizzes with indicated from the percentage of mastery learning by 92.7% of 32 students. So ethnomathematics in the research has been positive impact for students'. The SQ3R consists of 5 steps, namely surveys, questions, reads, recites, and reviews that actively involve students to think and understand mathematical concepts so that they can concentrate more and focus on the essence of learning materials. Research by A. Amir [41] on SQ3R provides a strategy that begins by building an overview of teaching materials which is practical and easy to apply in various learning approaches. Students can easily practice reading skills and absorb the content of the material [47]. Students can be more serious in following lessons because they start by reading the material first and then posing questions in the learning process [22]. The SQ3R method helps students to record questions, rewrite information, and conclude the learning outcomes [48]. The application of the SQ3R method assisted by ethnomathematics-oriented student worksheets is generally effective in developing students' metacognitive skills and concept understanding [49]. This method is excellent to encourage students in the learning process [22] and changing behavior in reading skill among students [48]. Learning activities was used SQ3R method assisted by an ethnomathematics-oriented student worksheet was better than SQ3R method without an ethnomathematics-oriented student worksheet because an ethnomathematics-oriented student worksheet refers to a scientific approach so that students' can observe, questions, gather information, associate, and communicate the material which related with lampung culture. The Combination of SQ3R method and an ethnomathematics-oriented student worksheet more impact in learning.

#### 4. Conclusion and Suggestions

It can be concluded that the application of the SQ3R method assisted by ethnomathematics-oriented student worksheets was more impact toward students' mathematical concepts understanding ability compared to the SQ3R method as the conventional method without assisted by ethnomathematics-oriented student worksheets. However, the application of the SQ3R method assisted by an ethnomathematics-oriented student worksheet was limited by the suitable learning materials so that the selection of materials is also important. Thus, it is important to stimulate the students to play an active role in class, foster a systematic mindset, and make it easier to answer questions ranging from low-order thinking skills up to higher-order thinking skills. Although there are some shortcomings, this research can be used as a reference for further research and can be developed on other materials.

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